NEWS RELEASE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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Address By
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National Aeronautics and Space Administration
To The
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Mr. Chairman, Governor Andersen, President Crane, members of the American Public Works Association:

It is a great pleasure to be with you here in Minneapolis at your annual Public Works Congress. I know that your purpose at this congress is to bring together from all parts of the United States and Canada those persons who are directly or indirectly engaged in the planning, development, and maintenance of public works facilities and services. In this capacity,yours is an undertaking of tremmendous scope and responsibility. Just this week it was necessary for President Kennedy to say that terror is not a new weapon, that free men could not be frightened by threats and that aggression would meet its own response. In these tumultuous times, it is easy to lose sight of the fact that we are a great and powerful and growing nation, and that despite threatening storm clouds each of us must carry on in our own field of endeavor, the work that builds the nation.

Because it is a part of your daily work as officials of state and local governments you are more keenly aware, I am sure, than most citizens of the fact that in the decade from 1960 to 1970, if we can avoid war, the number of our fellow-countrymen requiring food, clothing, and services will rise from 180 million to 213 million; that public and private construction will rise from an annual rate of $55 billion to more than $90 billion; that over 700 billions of construction will be put in place; and that with the addition of some $300 to $400 billions of maintenance and repair, our investment in these capital items in this ten-year period will add up to more than a trillion dollars.

You know that a very large part of this growth is taking place in our municipalities and metropolitan regions. You know that our national annual transportation bill is now more than 100 billion dollars -- one-fifth of our gross national product, indicating the specialization and division-of-work nature of our system. Even so, you know that we are only at the beginning of the solutions required to preserve and expand the benefits of our network of railways, airways, highways, and other forms of communication that operate to make our complex industrial system strong and profitable. To do this work of building, high quality personnel is required in local governments.

Most of you know that as Chairman of the Municipal Manpower Commission it was my privilege to assist in examining the problem of recruiting and retaining able men and women in these and other areas of local government. This Commission was brought into being by the American Municipal Association and a number of other organizations concerned with this problem through a grant from the Ford Foundation. Pat Healey and his associates in AMA first told me of the tremendous tasks and responsibilities which you who are public works officials face. The Commission is trying to help, and I would like to report that its work is proceeding vigorously under the leadership of its new chairman, Mr. John J. Corson, and its executive director, Mr. Allen Pritchard. I believe the results of its work will show where we stand in local government personnel, and point the way toward much-needed changes, but I think it is only fair to say there are no easy answers to high quality in municipal manpower.

When the President of the United States speaks in the international arena, he speaks for all Americans. But the expression of our will and purpose depends on more than the words used by our President. It depends upon the sum total of what each of us contributes in his own way working on the problems that are before him to add to our national strength. Many of our citizens are now answering the nation's call to the colors. Not all of us can serve in the military forces, nor are we all needed. Your own area of service is second to none in importance if our nation is to continue to grow and to realize the hopes and dreams expressed by Henry Wadsworth Longfellow when he wrote:

> Sail on, O Ship of State!
> Sail on, O Union, strong and great!
> Humanity with all its fears,
> With all the hopes of future years,
> Is hanging breathless on thy fate!

In addressing the United Nations on Monday, the President used these words:

> "Men no longer debate whether armaments are a symptom or cause of tension. The mere existence of modern weapons -- 10,000,000 times more destructive than anything the world has ever known, and only minutes away from any target on earth -- is a source of horror, of discord and distrust. Men no longer maintain that disarmament must await the settlement of all disputes -- for disarmament must be a part of any permanent settlement. And men no longer pretend that the quest for disarmament is a sign of weakness -- for in a spiralling arms race, a nation's security may well be shrinking even as its arms increase."

The President went on to say that "Every nation today should know, be he friend or foe, that the United States has both the will and the weapons to join free men in standing up to their responsibilities."

In Minneapolis, as in every city in the nation, I know we stand with the President on that.

In this kind of picture, where does our national space program fit? In the thirty-five years since Dr. Robert Goddard, the father of modern rocketry, proved that rockets could fly and perform useful work just as the Wright brothers twenty-three years earlier had proved the same for airborne vehicles, most of us have thought in terms of Fourth of July fireworks; then of small rockets for military use such as the bazooka and the air-to-air rocket; then of the V-2 terror weapon used by Hitler; then of intermediate range and intercontinental ballistic missiles capable of delivering the deadly hydrogen bomb; then in terms of manmade moons or satellites continuously circling the earth out beyond the atmosphere; and only very recently in terms of manned exploration of the universe and the application of space science and technology to solve a whole new range of problems associated with the growth of population and the increasingly complex organization of Government. I refer here to the great potential of communications satellites, weather satellites, and navigation satellites.

Beyond these particular applications, the fact that our National space program is the basis for a driving effort to develop to its highest point the technology of energy utilization, of electronics, of communications, of the use of new materials and metals, of complex computer-based systems management, and of the whole range of life sciences provides the opportunity to feed back or plow back into the process of economic growth and the solving of our Nation's problems and those of mankind everywhere the latest advances in these fields.

Congress, in 1958, specified that this space activity should be in a civilian agency, devoted to peaceful purposes, and it is not without significance that President Kennedy added emphasis to this as he pointed last Monday to the kind of future open to the United Nations. These are his words:

> "As we extend the rule of law on earth, so must we also extend it to the man's new domain: Outer space.
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> "All of us salute the brave cosmonauts of the Soviet Union. The new horizons of outer space must not be

riven by the old bitter concepts of imperialism and sovereign claims. The cold reaches of universe must not become the new area of an even colder war.

"To this end, we shall urge proposals extending the United Nations Charter to the limits of man's exploration in the universe, reserving outer space for peaceful use, prohibiting weapons of mass destruction in space or on celestial bodies, and opening the mysteries and benefits of space to every nation. We shall further propose co-operative efforts in weather prediction and eventually weather control. We shall propose, finally, a global system of communications satellites linking the whole world in telegraph, telephone, radio, and television. The day need not be far away when such a system will televise the proceedings of this body to every corner of the world."

The National Aeronautics and Space Administration program for space exploration is designed around the concept that men must participate directly in this exploration. In this program there is no dichotomy between manned and unmanned spaceflight. Each of these approaches contributes important information, techniques, and developments to the other.

We are convinced that concurrent advancement of both unmanned and manned spaceflight will pay off in a total science and technology of far-reaching, even revolutionary, importance to mankind.

The United States must make this effort for urgent scientific, technological, political, and economic reasons. In his May 25 State of the Union Message, President Kennedy said:

"Now is the time for a great new American enterprise -- time for this nation to take a clearly leading role in space achievement ... I believe that the nation should commit itself to achieving the goal, before the decade is out, of landing a man on the moon and returning him safely to earth."

Four major reasons underlie the national decision to marshal the resources required for leadership in space: 1) the quest for scientific knowledge; 2) direct and immediate application of satellites into operational systems; 3) the risk of delay in our space competition with Communism; and 4) the technological advances and stimulus to our economy that will emerge from the space effort.

Space research is a vigorously expanding field, whose growth is comparable to the development of nuclear physics after World War II. It is a field which cuts across the established areas of astronomy and physics and the earth sciences, and draws together scientists of varied backgrounds. The close interaction and exchange of ideas among scientists from many different fields have proven to be highly stimulating.

One of the goals of the NASA scientific program involves lunar exploration, manned and unmanned. From the scientific standpoint, exploration of the moon is of great importance. The moon may hold the answers to some of the key questions in science. How was the solar system created? How did it develop and change? Where did life originate? The moon is devoid of atmosphere in the terrestrial sense. Having neither winds nor rains, its surface is almost changeless. Thus the moon offers scientists a chance to study the very early matter of the solar system in practically the form in which it existed billions of years ago.

The great volume of U.S. research in the space sciences demonstrates the intense interest of American scientists. Data flowing into astronomy and the earth sciences from U.S. space experiments are providing significantly new ideas and concepts to these traditional disciplines.

Space itself, when instrumented by man, will provide system capabilities not previously possible. Early returns from NASA experiments are already leading to implementation of communications and meteorological satellite systems.

In 1960, NASA's Echo I passive communications satellite appealed to the world's imagination. The huge, aluminized plastic sphere has been seen by people in many countries. Echo proved that it is possible to communicate between distant areas on the earth by reflecting radio signals from a satellite.

Private companies have shown interest both in the Echo concept, and in "repeater" satellites that can receive messages at one point over the earth's surface and re-transmit them to ground receiving stations thousands of miles distant. Satellite communications will make worldwide telephone and television services realities, and will accommodate growth of global communications. This enhanced communication could well be a bond drawing people of the world closer together.

NASA's TIROS series of satellites has demonstrated the possibilities of vastly more accurate and longer-range weather forecasting. TIROS I transmitted nearly 23,000 television pictures of the earth's cloud patterns. TIROS II, launched last November, has transmitted more than 40,000 pictures and has reported important information about the atmosphere and the radiation of solar heat back from the earth.

The Weather Bureau has made use of TIROS III pictures of Storm Eliza in the Pacific and Hurricane Anna in the Atlantic. NASA also used TIROS III for weather support of Astronaut Grissom's July 21 Mercury suborbital flight. Twice a day as the satellite passed over the Caribbean, one of its two TV cameras was triggered to report weather conditions in the area of the flight. Also, when Captain Grissom was briefed just prior to his flight, he was shown TV pictures obtained from TIROS for visual comparison during the actual flight.

According to the House Committee on Science and Astronautics, "An improvement of only 10 percent in accuracy (of weather forecasting) could result in savings totaling hundreds of millions of dollars annually to farmers, builders, airlines, shipping, the tourist trade, and many other enterprises."

This is not the place to discuss military space missions but there is an important interchange of components and vehicles between the NASA and DOD programs. United States mastery of space is essential insurance against finding ourselves with a technology inferior to that the Russians will develop as they press forward on the space frontier. If we allow them to surpass us, their space technology in its military aspects will jeopardize our security.

In addition to potential military conflicts, the Free Societies are in competition with the Soviets for the support of the uncommitted peoples of the world. Space activity has great emotional appeal and we cannot afford for long the risk of being passed or appearing to be passed.

Today, prestige is one of the most important elements of international relations. Essential is the belief of other nations that we have capability and determination to carry out whatever we declare seriously that we intend to do and to which they attach importance.

In the minds of millions, dramatic space achievements have become today's symbol of tomorrow's scientific and technical supremacy. There is, without a doubt, a tendency to equate space and the future. Therefore, space is one of the fronts upon which President Kennedy and his Administration have chosen to act broadly, vigorously, and with continuous purpose. No other single field offers us the opportunity to gain more of what we need abroad and at the same time to achieve such a wealth of both practical and scientific results at home.

Our nation needs the stimulus, the knowledge, and the products that will evolve as we carry out our program of space exploration. The influence of the technical progress that will come into being through the integrating force and drive of a major space effort will be felt throughout the economy. Many of the instruments, equipment, power sources, and techniques that we devise to make space expeditions possible will be adaptable to other uses. The result will be substantial scientific advances and a variety of new consumer goods and industrial processes that will return tremendous benefits to us in practically every profession and activity.

Since January 31, 1958, this country has successfully launched 52 earth satellites, two solar satellites, and two deep space probes. Some of the scientific findings are:
...Discovery of two intense radiation zones trapped around the earth -- the Van Allen Belts.
...Determination that the earth is slightly pear-shaped with the stem at the North Pole.

Among our most successful experiments to date have been the Pioneer series of space probes. Pioneer V, for example -- launched into solar orbit on March 11 of last year -- was tracked into space to a distance of 22.5 million miles, still the greatest distance any man-made object has been tracked. This space probe gave us new and valuable information about cosmic rays, the earth's magnetic field, solar "storms," and evidence of the existence of a large "ring current" circulating around the earth at altitudes of about 30,000 to 60,000 miles.

As to the future, work has begun on an Orbiting Geophysical Observatory and NASA's plans for extending unmanned space exploration to the moon and beyond are maturing.

The Ranger series of spacecraft will land instruments on the moon to determine the nature and extent of tremors and measure the force of gravity on the lunar surface.

Following Ranger will come Surveyor, a spacecraft that will be able to make a "soft landing" on the moon. More delicate scientific instruments than those in Ranger can thus be employed. Surveyor will have aboard scientific instruments, including drills and tapes to analyze the lunar surface and to determine its makeup. At the same time, high resolution television cameras will transmit to earth pictures of the lunar terrain.

Also under way is a spacecraft that will fly close to Venus and Mars, and later perhaps other, more distant planets. This spacecraft, called Mariner, will carry instruments to measure planetary atmosphere, surface temperatures, rotation rates, magnetic fields, and surrounding radiation regions.

As you know, the historic flights of American Astronauts Alan Shepard and Virgil Grissom on May 5 and July 21 were important steps in Project Mercury, which is the first phase in the United States program for manned spaceflight.

These flights were made to learn how the astronaut, his capsule, and his equipment can best function together, as preliminary steps to putting an astronaut in orbit around the earth. The successful orbital flight of a robot astronaut on September 13 has advanced the program another step.

The first Mercury manned orbital flight will circle the earth three times and test man and capsule for about four and one-half hours. This flight will follow further tests of the Mercury system, and will probably come early next year.

The second phase of our manned spaceflight program is called Project Apollo. The Apollo spacecraft will be large enough for living and working quarters to accommodate three men. It will be injected into earth orbit by the Saturn launch vehicle which has a first stage with a thrust of 1,500,000 pounds.

The Apollo-Saturn combination will provide a multi-manned earth satellite, in which the three-man team can perform a great variety of scientific experiments while training for sustained spaceflight. Next will come voyages deeper into space including a three-man voyage around the moon and return to earth, and finally an actual moon landing and return, planned late in this decade.

The Saturn launch vehicle which is now under development will not provide the capability for circumlunar flight and lunar landing. In the near future, we will begin the development of much larger launch vehicles, with up to 20,000,000 pounds of thrust.

The design of the Apollo spacecraft itself must be kept as flexible as possible to meet the requirements of an orbiting-laboratory, as well as circumlunar and lunar-landing flights. To achieve this flexibility, a "modular concept" will be employed. In other words, various building blocks or units of the vehicle systems will be used for different phases of missions. The first component, which we call the "command center module," will house the crew during launching and entry. It will also serve as a flight control center for the remainder of missions.

The second module is a propulsion unit. In earth-orbital flights, this unit will return the craft to earth under either normal or emergency conditions. It will be used for maneuvering in orbit and for orbital rendezvous with other satellites. For circumlunar flights, the propulsion module will return the spacecraft to earth safely from any point along the lunar trajectory and will provide midcourse and terminal guidance corrections. In addition, the propulsion module will inject the Apollo spacecraft into an orbit around the moon and eject it from that orbit toward earth. For the lunar landing mission, the propulsion unit will serve as the take-off stage.

The third module is a propulsion stage that will decelerate the spacecraft as it approaches the moon, and will gently lower it to the moon's surface.

For the earth-orbital laboratory an additional module may be added to the spacecraft to provide capacity for scientific instrumentation and for life support during a reasonably long-lived orbit.

It is important to note that the command center module for lunar flights will have to be designed to permit entry into the atmosphere at 25,000 miles per hour, or at nearly one and one-half times the speed of a satellite returning from orbit. Developing protection against entry heating will be one of our most difficult problems. The spacecraft must have a moderate amount of maneuverability within the atmosphere to control the flight path and to allow landing at a pre-selected site.

All designs being considered must be capable of surviving either ground or water landings.

Among requirements for the Apollo system are the following:

1. A life-support system to provide a suitable environment for periods of several weeks.

2. Radiation shielding to give sufficient protection during passage to and from the moon as well as on the lunar surface.

3. A navigation system which will give position fixes, and which will compute the amount and direction of thrust for course correction when required.

4. An attitude stabilization system to be used throughout the flight. This system will permit orientation of the spacecraft for thrust control as well as for lunar landing and reentry through the atmosphere.

5. Communications for all phases of the flight.

In the field of international communications there is a constantly increasing need for radio channels as more and more people communicate with each other by telephone, as more and more businesses find the need for rapid communication, and as the tremendous promise of such new concepts as international television become apparent. Submarine cables are expensive and generally not available except on the routes where traffic is concentrated. Radio telephone and other traffic is subject to interference by magnetic storms and other forms of weather and solar disturbances.

In filling this need, the communications satellite serves very much as a microwave relay tower high in the sky over the middle of the ocean containing both a receiver and a transmitter and able to repeat messages rapidly and efficiently. The great problem is to find out how to make components for these useful satellites that can withstand the hostile environment of outer space -- intense radiation, a very high vacuum, and the acceleration and vibration of the rocket launcher. Also, to be withstood is the intense cold of space -- very near absolute zero.

We have three major communications satellite programs to test and improve the components. Success will permit the bringing into being of a worldwide communication network that will vastly increase the communications resources available to mankind and bring our nation closer to all mankind.